Users guide

Panel meter PW5 and PM5 with measuring input for the measurement of strain gauges (1mV/V; 2 mV/V; 3.3 mV/V)

Panel meter with performance features as follows:

- adjustable input amplification for 1mV/V, 2mV/V or 3.3 mV/V sensors
- 10 V integrated bridge supply for standard 350 ohm measuring bridges
- permanent line-break monitoring
- bipolar input range for compression and tensile forces
- integrated factory calibration for pre-calibrated weighing cells
- auto-sensor recognition for 1 mV/V, 2 mV/V and 3.3 mV/V
- measuring rate up to 50 measurements (measuring time adjustable from 0.02 to 10.000 seconds)
- 24 bit transducer resolution, of which up to 19 bits (500,000 / 0.0002 % of measuring range) noise-free!
- high long-term and temperature stability
- 5-digit digital display with range from -9999 to 99999 digits
- free scaling and setting of decimal point
- alignment of a sensor with up to 30 additional calibration points
- tare function for manual and automatic control
- fully automatic or semi-automatic calibration functions
- MIN/MAX value recording, can be called up or shown permanently in the display
- integrated conversion function with adjustable factor
- complex parameter and access security via several user levels with event counter

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1. Brief description

With the **PW5 and PM5 panel meters**, sensor sizes can be directly recorded via strain gauges. For this purpose, the units make an automatically controlled 10 V bridge supply available. The 5-digit display shows the measurement itself or the scaled value of the physical quantity. During programming, the display is used to feed back the set data and the user guide. A maximum of 4 relays are available to monitor the threshold values. Data from and to the unit can be transmitted via the serial interface.
The **PW5** model is suitable for weighing because of its 6-wire measurement. The unit has a very high input resistance, which means that even higher-ohm bridges can be accurately measured.
The **PM5** has a 4-wire connection with an additional calibration contact for the 80% calibration with mass pressure sensors. The latter does not necessarily have to be used, which means that the unit is also suitable for any other desired strain gauge measurement.

2. Safety instructions

Please read the users guide before installation and keep it for future reference.

2.1. Proper use

The **PW5/PM5** is designed for the evaluation and display of sensor signals. With the setpoints, it is possible to perform simple control tasks.

⚠ **Danger!** Careless use or improper operation can result in personal infury and/or damage of the equipment.

2.2. Control of the device

The panel meters are checked before dispatch and sent out in perfect condition. Should there be any visible damage, we recommend close examination of the packaging. Please inform the supplier immediately of any damage.

2.3. Installation

The **PW5/PM5** must be installed by a suitable qualified specialist or a person with a qualification in industrial electronics.

2.4. Notes on installation

- ❑ There must be no magnetic or electric fields in the vicinity of the device, e.g. due to transformers, mobile phones or electrostatic discharge.[1]
- ❑ The **fuse rating** of the supply voltage should not exceed a value of **6A N.B. fuse**.
- ❑ Do not install **inductive consumers** (relays, solenoid valves etc.) near the device and **suppress** any interference with the aid of RC spark extinguishing combinations or free-wheeling diodes
- ❑ Keep input, output and supply lines separate from one another and do not lay them parallel with each other. Position go and return lines next to one another. Where possible use twisted pair.
- ❑ Screen off and twist sensor lines. Do not lay current-carrying lines in the vicinity[1]. Connect the **screening on one side** on a suitable potential equaliser.
- ❑ The device is not suitable for installation in areas where there is a risk of explosion.
- ❑ Any electrical connection deviating from the connection diagram can endanger human life and/or can destroy the equipment.
- ❑ Do not install several devices immediately above one another (ambient temperature)[1]

[1] see technical data

3. Assembly

The **PW5/PM5** is intended for **installation** in a **control panel**. Before assembly, a cut-out must be made to accommodate the device. The sizes and tolerances are given in the technical data.
On the **front** are the **operating** and **display elements**.
On the **sides** are the fixing elements to mount the device in the panel.
On the **back** are the terminals for all the **electrical connections**.

A sealing strip is inserted between the contact surface of the front collar and the control panel.

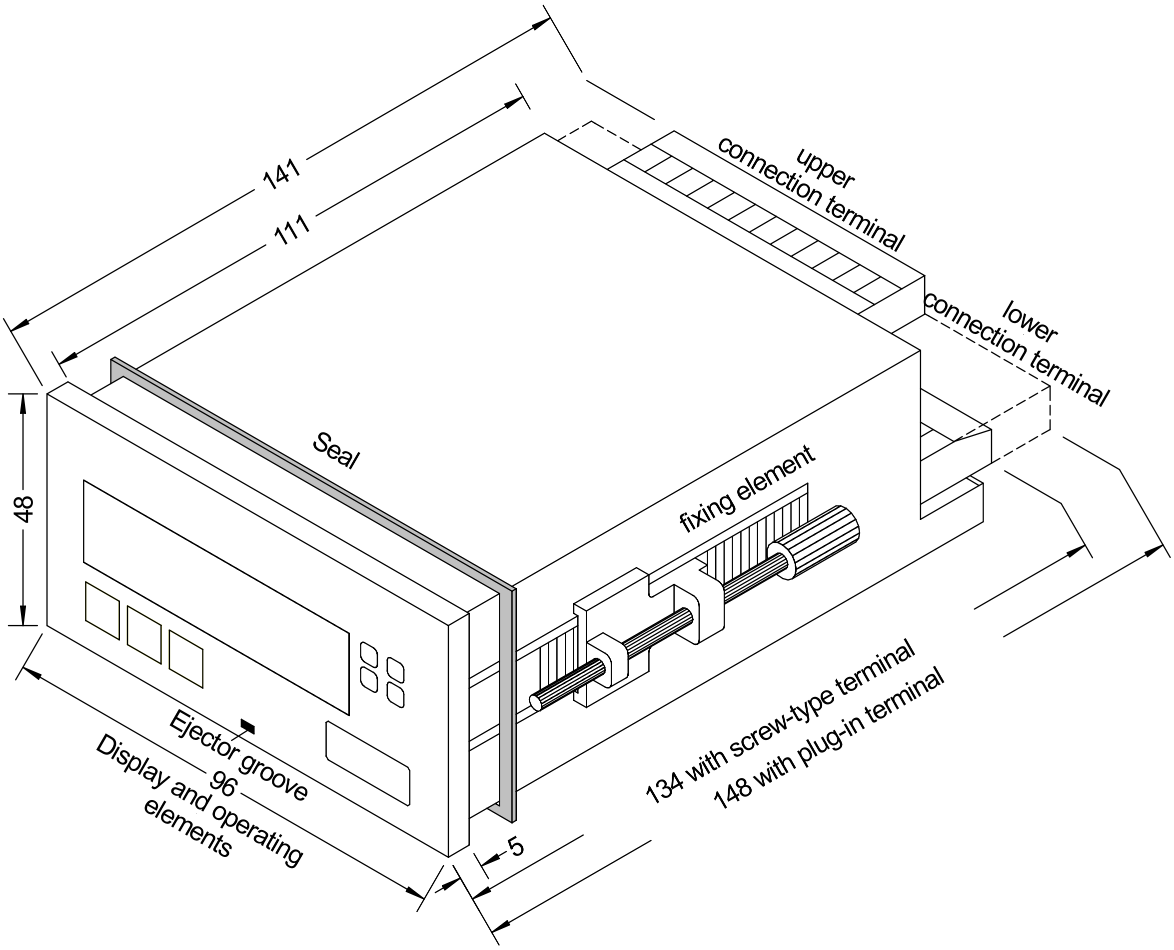
3.1. Insertion in the panel cut-out

I. Before inserting the unit, the **side fixing elements** must be pulled from the rail. To do this, slightly raise the screw head of the fixing element and pull the fixing element backwards at the same time.

II. Lay the sealing strip around the unit and push it up against the front collar. Then push the unit from the front **through the cut-out**.

III. Then place the fixing elements into the guide rails from the rear. While doing this, hold the unit from the front secure in the cut-out. Then, using a slotted screw driver, push the fixing elements as far as possible towards the front panel from the rear. Check that the sealing strip is properly positioned between the front collar and the control panel and correct it if necessary.

IV. Finally secure the device by tightening the screws on the fixing elements until they turn freely. The fixing elements have a slip coupling to prevent any overtightening of the thread; they hold the unit tight with the optimum amount of force.



View of the **PU5**

3.2. Dismantling

To remove the unit, follow the same steps as described for **Assembly** in reverse order

For the version featuring the protective system IP65, a **new sealing** strip must be used **when** the unit is **replaced**.

3.3. Dimension strip

A strip with a physical unit can be inserted in the dimension window, see ***Chapter 5.1.3***.
To do this, take the following steps:

I. Insert a slotted screw driver (size 0 blade) in the ejection slot at the bottom of the front panel and lever out the front.
II. On the back of the front panel, towards the outer edge is a slit in to accommodate the appropriate strip.
III. Insert a suitable dimension strip.
IV. Insert the front panel into the front collar of the unit and press slightly against the upper and lower edges so that it snaps back into the housing.
V. Check that the plastic elements on the front have not bent the LED towards the back. This is the case if the digits are not sharp. If this does happen, remove the front panel again and replace it carefully.

4. Electrical connection

All the necessary signals for operation are connected to the rear terminals.

4.1.1. Upper connecting terminals

The setpoints are tapped on the 12-pole connector strip. Depending on the version, there are between zero and four changeover contacts (**N**ormally-**C**lose, **COM**mon, **N**ormally-**O**pen).

Relay 1			Relay 2			Relay 3			Relay 4		
21	22	23	24	25	26	27	28	29	30	31	32
NC	NO	COM	NC	NO	COM	Öffner	NC	COM	NO	NC	COM

Via the 3-pole connector strip, a serial interface is connected. If neither of the two options is implemented in the unit, the respective connecting terminals will be missing.

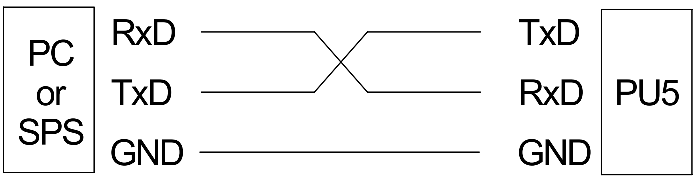
RS232		
41	42	43
GND (RS)	TxD	RxD

or

RS485		
41	42	43
GND (RS)	Data B (+)	Data A (–)

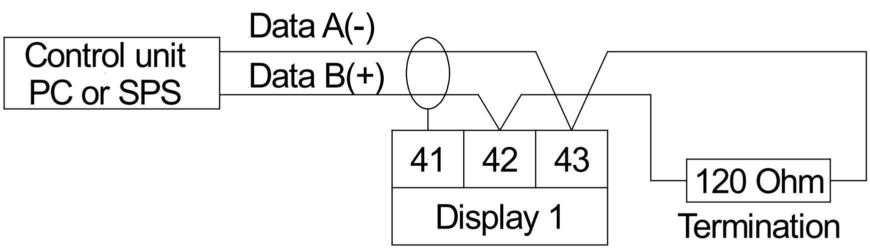
The lines for the **RS232 interface** must be connected **1:1** so that TxD is connected to TxD and RxD to RxD.

Connection pattern PC or SPS ⇔ PU5



The **RS485 interface** is connected via a shielded data line with a twisted pair.

At each end of the bus, a termination of the bus lines must be connected. This is necessary to guarantee reliable data transmission on the bus. For this, a resistance of 120 Ohm is inserted between the lines Data B (+) and Data A (–).



Caution! The potential reference can lead to a compensating current (interface ⇔ measuring input) with a non-galvanically insulated interface and can thus affect the measuring signals.

4.1.2. Lower connecting terminals

Input signal, analogue output, sensor supply and supply voltage are connected to the lower connecting terminal.

Terminals 1–7 Input signals
The sensor is connected to these terminals.

A 6-wire sensor can be connected to the input of the **PW5**.

Sensor	1	2	3	4	5	6	7
DMS Sensor	Supply+	Sense+	Signal+	Signal-	Sense-	Supply-	

If the sensor only has a 4-wire connection, terminals 1 and 2 or terminals 5 and 6 can be bridged directly to the display. However, as a rule, this generally leads to a loss of accuracy through the line impedance.

At the input of the **PM5,** a 4-wire sensor can be connected with a calibration wire (CAL).

Sensor	1	2	3	4	5	6	7
DMS Sensor	Supply+	Supply+	Signal+	Signal-	Supply-	Supply-	CAL

Mass pressure sensors, which frequently have an additional wire for the artificial unbalance (80%) of the bridge, can be automatically calibrated via terminal 7.

Examples of the connections for various sensors can be found in section ***Connecting examples*****.**

Terminals 8–9 Analogue output
The signal for the analogue output is provided on these terminals. Depending on the capabilities of the unit, a current or voltage signal can be tapped.

8	9
Analogue output +	Analogue output –

Terminals 10–12 Digital input
These terminals are used to control the digital input. With this, various functions (e.g. taring) can be triggered in the unit. With a potential-free external contact, terminals 10 and 12 are simply connected. With an active output, terminal 11 serves as the reference point. The digital input is designed for an input signal of 24 VCD.

10	11	12
Contact supply +	Contact supply –	Digital input

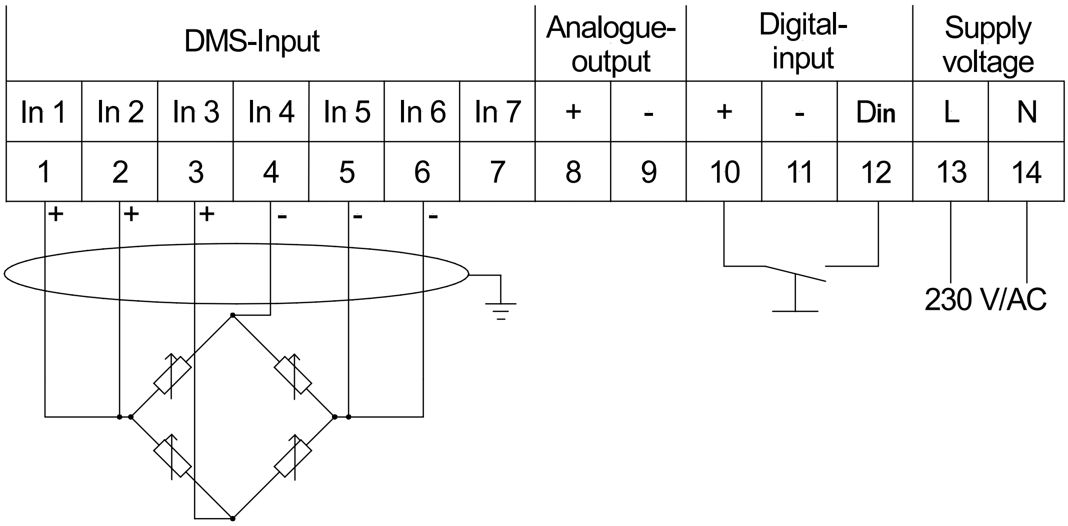
Terminals 13–14 Supply voltage
The supply voltage for the unit is connected to there terminals. The supply voltage is galvanic insulated from the measuring input.

13	14	Supply voltage
L+	L–	24 VDC voltage
L	N	115 or 230 VAC, depending on version

4.2. Connecting examples

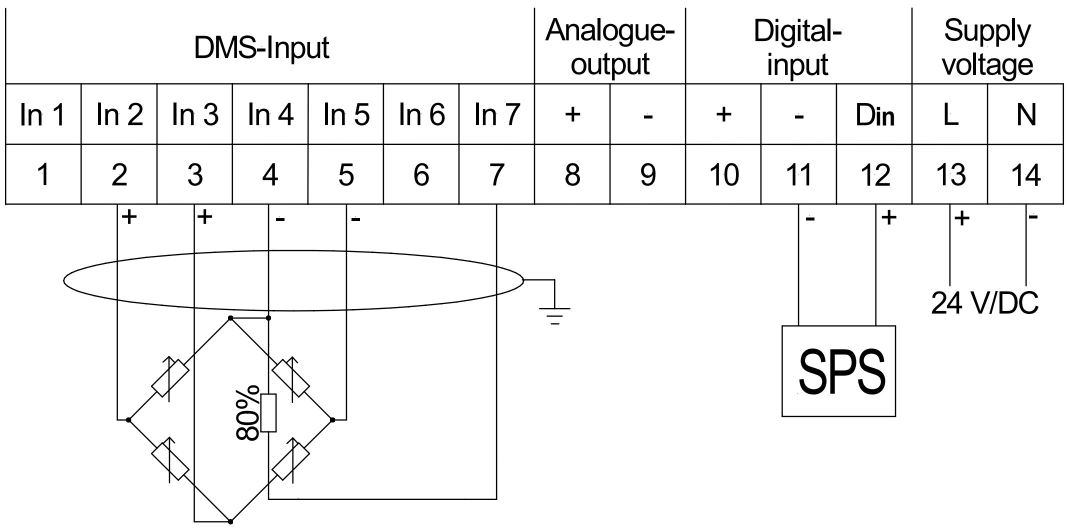
This section gives a few examples of practical connections. Other connection options can be combined from the various examples.

Measurement of a **6-wire sensor** with a **PW5** using the digital input via a potential free contact; auxiliary voltage 230 VAC.



Measurement of a **4-wire sensor** with a **PM5** with an actively switched digital input; auxiliary voltage 24 VDC

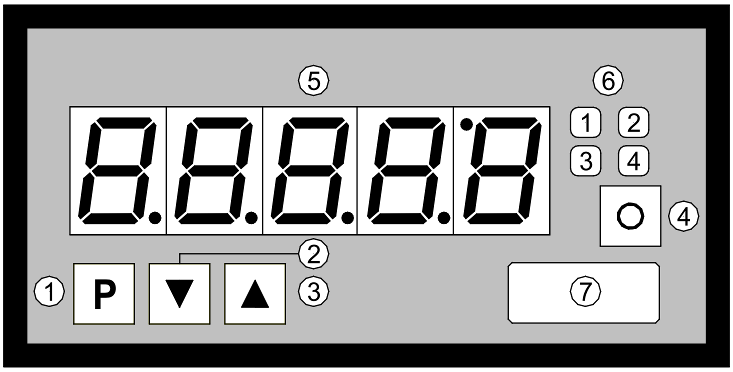
Important: The potential of the digital input is connected with the sensor potential.



5. Handling

The unit is operated via the [P], [UP] and [DOWN] keys.

Operating and display elements



1 Programm key [P]
2 Minus key [DOWN]
3 Plus key [UP]
4 Tara- or calibration key
5 7-segment display
6 Setpoint display 1-4
7 Dimension window

5.1.1. Keys

The **PW5/PM5** has **three keys** with which you can parameterise and call up various functions during operation.

1	Program key [P]	With the program key, the programming mode is called up and/or various functions are performed in programming mode.
2	Minus key [DOWN]	With the minus key, the MIN memory is called up or parameters set in programming mode.
3	Plus key [UP]	With the plus key, the MAX memory is called up or parameters set in programming mode.
4	Tara key (calibration key)	With this key, special functions like taring or calibration can be triggered.

5.1.2. Displays

The **PW5/PM5** has a **5-digit** 7-segment and 4 LED.

5	7-segment display	The 7-segment display displays measurements or, during programming, the program numbers or parameters.
6	Setpoint display	The setpoint display indicates the state of the relays. If a relay is switched, the LED lights up. If relays are not implemented, these displays can be used for the optical feedback of threshold values.

5.1.3. Dimension window

7	Dimension window	The dimension window shows the factory-set **physical unit** for the measurement. The dimension can also be changed by the user as described in chapter ***3.3 Dimension strip***.

5.2. Switching on

Before switching on you have to check all the electrical connections to make sure they are correct. On completion of the installation, the device can be switched on by applying the supply voltage.

5.3. Starting sequence

During the switching-on process, a segment test is performed for approx. 1 second, whereby all LED on the front (including setpoint LED) are triggered. After this, the type of software is indicated for approx. 1 second and then, also for 1 second, the software version. After the starting procedure, the unit changes to operation/display mode.

5.4. MIN/MAX-memory

The measured minimum and maximum values are saved in a volatile memory in the unit and get lost when the unit is switched off.
You can call up the contents of the memory by pushing (less than 1 second) the [UP] or [DOWN] key. The relevant value is indicated for approx. 7 seconds. By briefly pressing the same key again, you will return immediately to the display mode.

[UP] ⇒ Display of the MAX value
[DOWN] ⇒ Display of the MIN value

You can erase the value shown in the display by simultaneously operating the [UP] & [DOWN] keys. The erasure is acknowledged by horizontal bars.

The content of the memory is lost when the unit is switched off. Furthermore, switching over to the MIN/MAX values or a **change of the display** can be **prevented** through a special setting (**PN16=8**).

5.5. Overflow/Underflow

An **overflow** of the display is indicated by **horizontal bars** at the **top** of the 7-segment display. The display also responds with an overflow in the event of a line interruption.

An **underflow** of the display is indicated by **horizontal bars** at the **bottom** of the 7-segment display.

Every **setpoint** can be optionally switched to an **error recognition mode**, so that the setpoint reacts when an **overflow or underflow is recognised** (optionally with pull-in or release of the contact).

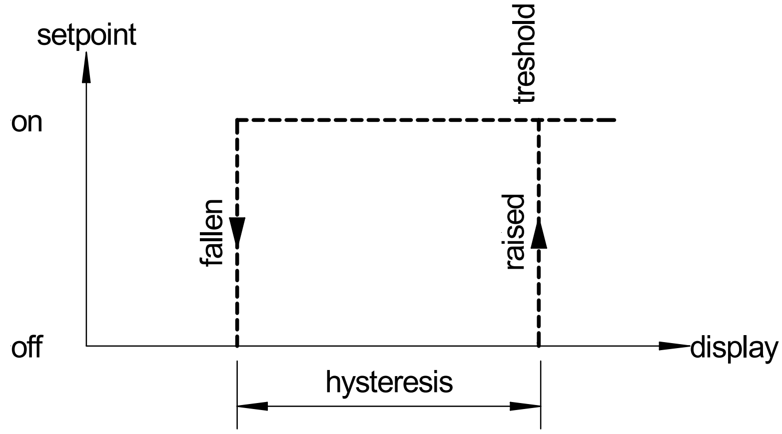
5.6. Relays

With the aid of the LED next to the 7-segment display, you can view the switching state of the relays. An active relay is indicated by the relevant LED lighting up.

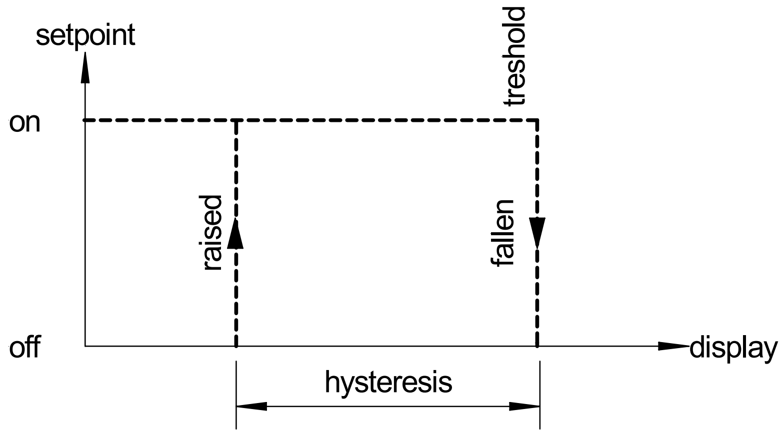
The relays have the following properties with regard to their switching characteristics:

Setpoint x	deactivated or activated
Threshold	threshold value for switchover
Hysteresis	width of the window between the switch thresholds
Operating principle	active above SP value / active below SP value
Switch-on-delay	time between reaching the threshold and the resultant switching on of the relay
Switch-off-delay	Time between reaching the threshold and the resultant switching off of the relay

Active above SP value
The setpoint is off below the threshold and on reaching the threshold.

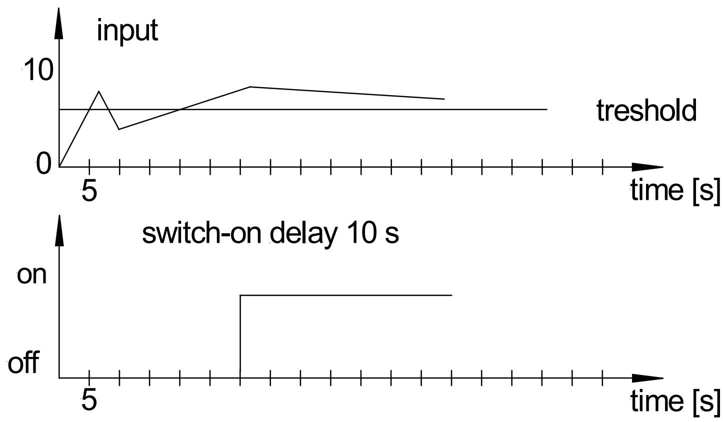


Active below SP value
The setpoint is on below the threshold and switched off on reaching the threshold.



Switch-on delay

The relay is on 10 seconds after reaching the threshold; briefly exceeding the threshold does not lead to the relay being switched on. The switch-off delay functions in a similar manner, in other words it keeps the setpoint switched on until the parameterised time has elapsed.



5.6.1. Optical response, flashing display

The switching on of one or more setpoints can also be set to trigger a flashing of the display to enhance the optical response.

Example:
Let us assume the threshold for flashing of the display is set at setpoint 2. If setpoint 1 is exceeded and setpoint 2 is not, the setpoint **LED 1** lights up permanently. If setpoint 2 exceeds the threshold, the 7-segment display will start to flash, setpoint 1 will light up permanently and setpoint LED 2 will flash.
The flashing enhances the optical response and the operator sees immediately that an important threshold has been exceeded with this unit

5.7. Analogue output

The analogue output is used to pass on a measurement. The analogue output is parameterised via the two program numbers **PN20 end value** (full scale) and **PN21 initial value** (offset). With the offset value, the value is set at which the analogue output shows its minimum value (e.g. 4 mA) and with the full scale, the value at which the output shows its maximum value (e.g. 20 mA).
It is possible in this way to rescale the input signal of a measuring transducer or even to convert it into another standard signal.
The analogue output can be deactivated or activated via the **PN22 control value**. Furthermore, the analogue output signal can either be allocated to the **current value** (with possible taring), the **MIN value**, the **MAX value**, the **HOLD value** or the **absolute value** (without possible taring).
The analogue output is updated in the cycle of the measuring time (PN14) and has, at maximum, a resolution of 12bit (4096 dots) and, at minimum, the resolution of the selected output range PN20 – PN21. In other words, if the difference between PN20 and PN21 is less than 4096, the resolution of the analogue output is reduced to PN20 – PN21 dots!

5.8. Digital input

With the digital input, a wide variety of special functions can be triggered in the unit. These include various taring and calibration functions, the HOLD function and switching over of the display mode. The digital input can either be controlled actively with a 24 VDC signal or passively via a potential-free contact.

5.8.1. Event counter

Since a change made to the configuration opens the door to access calibratable areas, changes are recorded in an event counter. The event counter counts only when a change is made to the relevant configuration sections. This is displayed when the system is started up, as e.g. "C.0023", in order to allow the operating staff and quality management staff to check the configuration status.

5.8.2. Taring or calibration

Taring or calibration can be carried out via the fourth key on the front or via the digital input on terminal 12.
The unit can, on being switched on, be set to various modes via program numbers. Furthermore, it is possible to differentiate between the evaluation of the key on the front and the digital input. The tare key on the front and the digital input are interrogated independently of one another. For taring, the fourth key, the digital input or both in parallel can be used.

5.8.3. **PM5** Calibration of mass pressure sensors

Many standard sensors for mass pressure measurement have a special CAL wire. If this is connected to *DMS-Minus*, an unloaded bridge becomes so unbalanced that the signal value corresponds to an 80% load (80% is a standard value that can, however, be changed for the display). In addition, the display has its own CAL terminal on which the signal wire can be laid. If a calibration is triggered, the unit automatically first performs a zero balance and then a load balance. The latter is achieved by the display switching the CAL wire via a relay contact against supply, and then evaluating the signal value as an 80% load. This measurement is used for the linearisation.

5.8.4. Sensitivity recognition

The units support a sensitivity recognition, which can automatically distinguish between 1 mV/V, 2 mV/V and 3.3 mV/V sensors. For this, a calibration point >0.00% must be selected. With the aid of the offset voltage and CAL voltage, the display can recognise whether it is a 1 mV/V, 2 mV/V and 3.3 mV/V sensor and then adjusts the PM0. In the second run, the calibration is then carried out in the relevant measuring zone.

The procedure is as follows:

1. Sensitivity recognition

⇒ Display of "SEnS" for the entire process.
⇒ Amplification of the measuring input is set to 1.
⇒ Offset voltage is measured.
⇒ CAL relay is switched.

In semi-automatic mode, the procedure is as follows:
⇒ Display of "Sen2" flashing ⇒ until [P] key or release is activated

⇒ CAL voltage is measured.

⇒ The calibration relay is switched off.
⇒ Display of “FInd1” with 1mV/V etc. ⇒ 1 second
If the sensor recognition has not identified an overflow and the sensor was able to allocate a 1mV/V- (=FInd1), 2mV/V- (=FInd2) or 3.3mV/V- (=FInd3) bridge
otherwise
⇒ display of an error message ⇒ 2 seconds

Error messages after sensitivity recognition (priority from 1 to 5)

- "SErr1" if no offset was recognised.
- "SErr2" when the end value for CAL is outside the permitted range.
- "SErr3" if the end value has not changed under CAL by min. 1% of measuring range
- "SErr4" when PN0 is set to 2, 3, 4 and the error is 10% higher than expected.
- "SErr5" when, in semi-automatic mode, 60 seconds has elapsed.

With an error message, no changeover of PN0 is made, otherwise, if PN0 is preset to 0 or 1, the value is changed to 2, 3 or 4. If PN0 is preset to 5 or 6, the most suitable amplification setting (PN0 = 7, 8 or 9) is set so that a resolution of around 120% of the end value can be ensured.

5.8.5. Automatic calibration

The **PM5** unit generally performs an automatic calibration. Depending on the setting, this can be triggered via the fourth key or the digital input. During calibration, the sensor must be free of pressure or the balance is without any load. Since, in the case of the **PW5**, manual intervention is generally required, the semi-automatic calibration takes effect here.

The calibration procedure is as follows:

Press [CAL] key

⇒	Display of "CAL1"	⇒	1 second
⇒	Determine offset value	⇒	display measurement for 2 seconds

In semi-automatic calibration mode, this is followed by:

⇒	Display of "CAL2" flashing	until [P] key or release is activated	
⇒	Display of " CAL2"	⇒	1 second
⇒	Switch CAL line against strain gauge	⇒	during display of CAL2
⇒	Determine load value n calibration point	⇒	display measurement for 2 seconds

If the calibration was successfully concluded,

⇒	Display of "-----"	⇒	1 second
	Otherwise, if an error occurs,		
⇒	Display of error message	⇒	2 seconds

The following error messages are possible (priority from 1 to 4):

- "CErr1" if neither offset nor end value are within the measuring range
- "CErr2" if the end value is not at least +/-1% of measuring range greater than offset
- "CErr3" if the end value is outside the measuring range
- "CErr4" if the offset or end value at PN0 = 1, 2 or 3 is 10% <> expected value
- "CErr5" termination of semi-automatic calibration after 60 seconds

5.8.6. Taring

In weighing technology, a taring process is generally carried out before proceeding with a measurement. This involves setting the display value for the current sensor value to zero.

For these two cases, the standard taring procedure is as follows:

⇒ Display of "ooooo"	⇒ 1 second
⇒ Determine offset value	⇒ in measuring time
⇒ Display of "oFAIL" if measuring range overflow	⇒ 2 seconds

With rapid taring, only one error message, if available, is displayed. No message is sent if the taring process was successful as this is frequently not desired.

5.8.7. HOLD function

The HOLD function is always active in the background. If the digital input is deactivated, the HOLD value is permanently overwritten by the current measurement. Only when the digital input is activated is the last measured measurement recorded as long as the digital input remains activated. The function is purely static and can only be operated via the digital input.

6. Interface

All PW5/PM5s can be optionally programmed or configured via an interface. The units do not have an interface as standard.

Pressing the ENTER or <CR> key is always denoted by↲.

6.1. Operating modes PN34

The interface can be operated in various modes that can be parameterised via the PN34.

PN34=0
Standard mode, in which the unit only replies if called on to do so. This mode is used only for configurating.

PN34=1

Transmission mode, in which the measurements are cyclically transmitted via the serial interface within the set measuring time.

The transmission mode is interrupted on receipt of “>↲“ and the unit changes to standard mode. To change back to transmission mode, the display must be restarted, either by entering the command **S** ↲ or by switching the device off and on.

With the transmission mode, the display value is transmitted via the interface in ASCII format. Minus signs and decimal points are also transmitted so that the output can be displayed directly on a terminal or processed by a SPS. Zeros at the front are suppressed during transmission. With an over or underflow, the display transmits horizontal bars (hyphens) " - - - - - ↲".

Examples: "0.00 ↲" ; "-9.99 ↲" ; "999.99 ↲" ; "-123.45" ; " - - - - - ↲"
With the aid of this simple protocol structure, the display data can be transferred very easily to a PC etc. and further processed there. In the simplest case, a terminal program from the operating system is sufficient to store the received data in a file.

6.2. RS232 / RS485

For configuration, a terminal program or a special configuration tool (e.g. "PM-Tool") can be used.

The communication is a straight point-to-point connection. The baud rate is set to 9600 baud, with 8 databits, without parity and one stopbit.

The structure of a command: *Program number / Command / Value /* ↲.

Program number	See program number table
Command	**=** describe a parameter with a decimal value **B** describe a parameter with a binary value
Value	A value from the range of values given in the program number table
↲	ENTER or <CR>, conclusion of any command

Below, for example, the value for the program number 61 is parameterised with a value of 5000.

"61=5000↲"

All values are written directly into the **EEPROM** of the unit and are valid after changing into operating mode. In contrast, the communication parameters of the interface only become effective after restarting the display.

To simplify the input, there is no need for "." (dots) and "," (commas).

In the basic setting, a message is not acknowledged, which enables the parallel programming of several displays. To check the overall configuration, a checksum can be called up on the LED display.

Successful programming is indicated by a "PROG“ in the LED display.

If you want to call up the content of a program number (e.g. 61), you can do so with the command

"61↲"

The display sends the corresponding value back in ASCII format.

e.g. "5000↲"

Should a program number also contain subsidiary parameters – like the corresponding binary value in the case of a calibration point – it can be called up via the extension "B".

e.g. *"1B3433↲"*

If the scaled value needs to be changed, the extension "=" is used.

e.g. *"1=12000↲"*

Any entry that cannot be interpreted is acknowledged with an "**Err**" in the display.

If a non-existent program number or an unknown command is sent, the display will acknowledge this with an "**?**" via the interface.

In the normal condition, the display does not send an acknowledgement back. Only when the value is called up or the acknowledgement mode is activated by the “>“ command does the display send a response from then on. This mode is exited after restarting the unit or 15 seconds after receiving the last command.

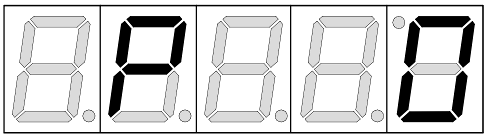
6.2.1. Serial special commands

In addition to the program number control, special commands are also possible. In the following table we have dispensed with giving the ↲ at the end of the command.

Command	**Acknowledgement**	**Function**
S		Restart the display
Q		Change in display mode
A1	Display value	Call up display value via the interface
A2	MIN value	Call up MIN value via interface
A3	MAX value	Call up MAX value via interface
A4	HOLD value	Call up HOLD value via interface
A5	Absolute value	Call up absolute value (without tare) via the interface
RH	MAX reset	Reset the MAX value
RL	MIN reset	Reset the MIN value
TAR	Taring	Trigger tare via the interface
B	Binary value	Call up binary value vie interface
KAL	Calibration	Perform autocalibration
KAL1	Calibration	Sensor calibration of the calibration point to PN1
KAL2	Calibration	Sensor calibration of the calibration point to PN2
U		Load default configuration
P		Call up test total
>	>	Activate interface acknowledgement

7. Programming

In the display, the program numbers (PN) are shown, right-justified, as a 3-digit number with a **P** in front of them.



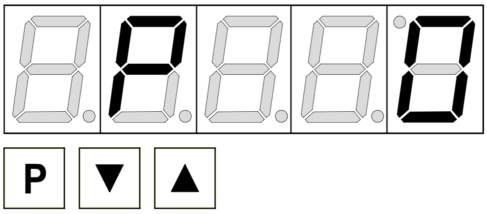
Display of e.g. program number 0

7.1. Programming procedure

The entire programming is done by the steps described below.

Change to programming mode

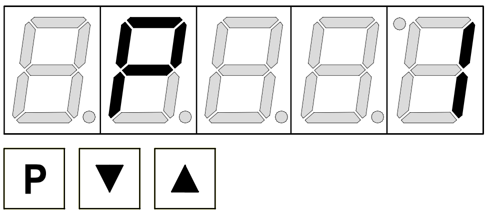
Push the [P] key to change into programming mode. The unit goes to the lowest available program number. If the programming lock is activated, the key must be pushed for at least 1 second.



Example:
Change to programming mode by pushing key [P]. The first released program number (PN) appears, in this case PN0.

Change to other program numbers

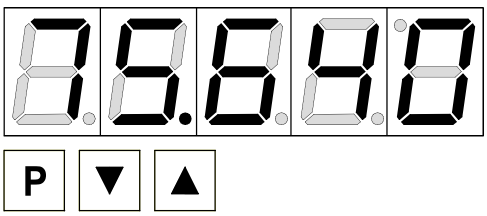
To change between individual program numbers, hold the **[P] key down** and push the **[UP]** key for changing to a higher program number or the **[DOWN]** key for changing to a lower number. By keeping the keys pushed, e.g. [P] & [UP], the display will begin, after approx. 1 second, to automatically run through the program numbers.



Example
A 3 is parameterised under PN1.
Keep the [P] key pushed and push the [UP] key several times. PN1 appears in the display. Under this parameter the full scale of the input 2 can be changed.

Change to the parameter

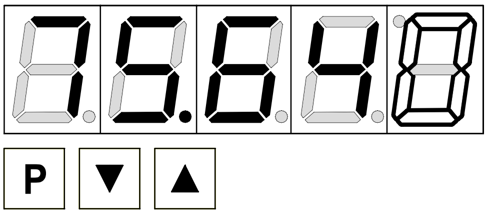
Once the program number appears in the display, you can push the **[DOWN] or [UP] key** to get to the parameters set for this program number. The currently stored parameters are displayed.



Example:
By pushing the [DOWN] or [UP] key, the currently stored value for PN1 appears in the display. In this case, it is 75,640
.

Changing a parameter

After changing to the parameter, the lowest digit of the respective parameter flashes on the display. The value can be changed with the [UP] or [DOWN] key. To move to the next digit, the **[P] key** must be briefly pushed. Once the highest digit has been set and confirmed with [P], the lowest digit will begin to flash again.

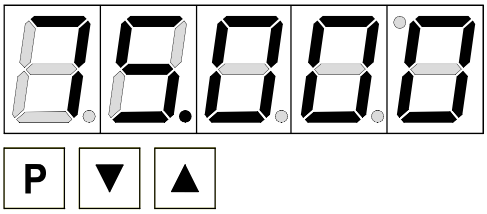


Example:
The 0 is flashing this is the lowest digit and asks if you want to change it. Let us assume the figure is to be changed from 75,640 to 75,000. Briefly push the **[P]** key to move to the next digit. The 4 begins to flash. Change the figure by pushing [UP] or [DOWN] to change the digit from 4 to 0. Briefly push the [P] key to move on to the next digit. The 6 begins to flash. Change the digit by pushing [UP] or [DOWN] to move the 6 to a 0. Briefly push the [P] key to move to the next digit. The 5 and 7 do not need to be changed.

Saving parameters

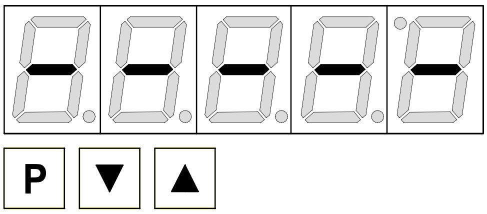
All parameters must be acknowledged by the user by pushing the **[P] key** for one second. The changed parameters are then taken over as the current operating parameters and saved in the EEPROM.

This is confirmed by horizontal bars lighting up in the display.



Example:
Save the parameters by pushing [P] for 1 second.

All the **newly entered data are confirmed** by the unit. If no confirmation is received, the relevant parameters have not been saved.



Example:
You receive confirmation from the unit that the changes have been saved through the appearance of horizontal bars in the middle segments.

7.1.1. Changing from programming to operating mode

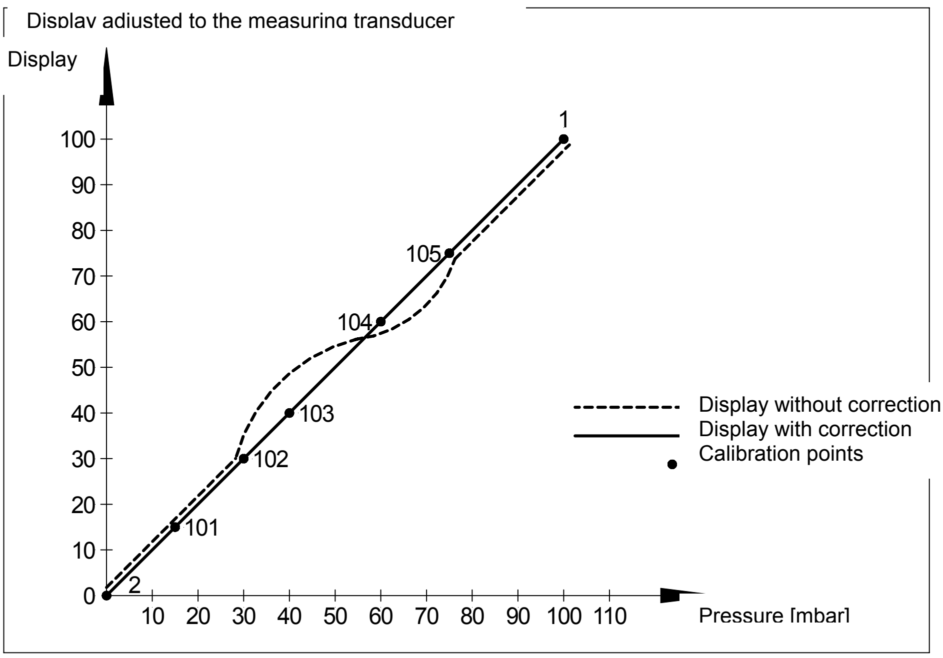
If no key is pushed in the programming mode for about 7 seconds, the unit will return automatically to operating mode.

7.2. Linearisation

With the linearisation, the **PW5** and **PM5** offer the possibility of linearising **strain gauge sensors** for the display of the measurements and their further processing (analogue output), **In addition** to the 2-point calibration, a **maximum of 30 calibration points** can be programmed.

Example: For the programming of e.g. 5 additional calibration points, the number 5 must be entered under PN100.
Subsequently, for each of the calibration points, the pressure must be placed on the sensors, and the corresponding display value programmed under the following program numbers PN101 – PN105.
The sensor signal must be parameterised with a **strictly monotonous rising** configuration. A gap of at least +1 digit to the previous display value should be adhered to, otherwise it will be rejected through non-appearance of the save message, cf. saving parameters.

Calibration point (PN)	Pressure [mbar]	Output transducer [mV/V]	Display before correction (IN)	Desired display (OUT)
2	0	0.0	2.5	0.0
101	15	0.3	16.5	15.0
102	30	0.6	31.0	30.0
103	40	0.9	46.0	40.0
104	60	1.1	57.0	60.0
105	75	1.4	73.5	75.0
1	100	2.0	100.0	100.0



Linearisation of a pressure transducer for 0...100 mbar with a sensor of 2 mV/V.

8. Program number description

The **PM5** and **PW5** units are parameterised or preset via program numbers because of the many different settings.

8.1. Strain gauge PN0

With this program number, the sensitivity of the strain gauge can be selected.

8.1.1. PN0 = 0, 1, 5, 6

With these settings, the maximum amplification (as with PN0=10) is preselected so that the output ranges of all possible sensor types can be recorded and evaluated.

8.1.2. PN0 = 2, 3, 4

This setting is based on pre-calibrated sensors, so that the start and end value are generally fixed. With a change to PN1 or PN2, the relevant binary calibration point is set to the factory setting. Should a calibration be subsequently performed, the calibration points will be checked for plausibility.

8.1.3. PN0 = 7, 8, 9, 10

With this setting, the calibration points are not fixed. When programming PN1 and PN2, the momentary measurement is taken from the input. PN1 and PN2 must be at least 1% of the measuring range apart. When programming PN1, the CAL wire (calibration point) is switched 2 seconds before taking over the measurement, and the set calibration point offset against the momentary binary value.

8.2. End value setting PN1

The end value for the display value and measurement may be larger or smaller than the offset setting PN2. It must differ from its measured value by at least 1% of the measuring range of the programmed offset value in PN2. If a standard sensor has been selected (PN0 = 2, 3 or 4), the measuring value determined ex works, 1mV/V, 2mV/V or 3.3mV/V, is entered. If PN0 is set at 7, 8, 9 or 10, the display switches – if available – its CAL wire, waits for 2 seconds and then takes over the preset calibration points based on the set calibration point PN10.

8.3. Offset setting PN2

With the offset setting PN2, the measured value must differ by at least 1% from the end value of PN1 calculated on the measuring range. If PN0 is selected at = 2, 3 or 4, the 0mV/V valued determined ex works is taken as the measurement in PN2. If PN0 is selected at = 7, 8, 9 or 10, the currently set measurement is taken as the calibration point.

8.4. Decimal point setting PN3

With this program number, the desired number of places after the decimal point can be defined. The displayed decimal point moves from left to right or vice versa, with the value 0 being taken as a basis.

8.5. Shifting the offset value PN5

In this program number, the currently effective offset value can be checked. It can also be changed in this program number. With a transient taring operation (PN6 = 2, 3 or 5), the tare value is lost when restarting the unit, otherwise the value can be found in the provided configuration memory for the program number.

8.6. Taring function PN6

Suitable taring functions can be selected for various applications. These functions differ essentially in the method of saving the measured offset value. If no taring is selected, **PN6=0**, the offset value is always taken to be zero.
With permanent taring, **PN6=1**, the measured offset value in program number PN5 is permanently saved in the user settings.
With transient taring, **PN6=2**, the offset value is retained only for the time the display is in operation. It is lost once the voltage is switched off. Since the integrated permanent memory has only limited writing capacity, this setting is used for very frequent taring operations (>10x a day) as with recipe balances. The trigger for the taring must be activated for 1-2 seconds.
With fast transient taring without a message using **PN6=3**, the taring is performed within a measuring cycle, whereby the offset value is lost when the unit is restarted. This mode is intended for fully automatic processes in which fast, frequent taring is required via a control system. The taring signal is filtered only with 50 ms and the taring is carried out without any message.
With the **PN6=4** setting, the taring is performed on the offset calibration point PN2. There is no shift in the offset value, but the linearisation of the sensor is changed directly. The currently set measurement for PN2 is taken over. The trigger must previously be activated for at least 1-2 seconds.
With the static taring, **PN6=5**, the taring operation is performed with an upward slope and held until the signal is taken away again. After that, the absolute value is displayed. This function is especially suitable for checking tightness where the pressure loss and final pressure have to be measured.

8.7. Target value for taring PN7

For the display, a target value can be determined for the taring operation. As a rule, it is always calibrated to zero, i.e. zero is shown in the display following a taring operation. However, this value can also be changed to any other desired value. If 200 is entered under PN7, the offset value will shift so that, after taring, 200 is displayed. Both of these happen, of course, only on condition that the display is parameterised to the current measurement PN15=1. Where no trigger is selected for a taring (PN8=0), a taring operation is performed during programming.

8.8. Trigger for taring PN8

The taring set in the unit via PN6 can be triggered via several sources and unit statuses. If **no trigger** (**PN8=0**) has been selected, but a taring function has been selected, taring is performed during programming of the target value PN7. If the **digital input** is selected **as a trigger** (**PN8=1**), a taring operation is performed when applying a positive voltage. The same applies to the **4th key** on the display front, which can be selected for taring via **PN8=2 as the trigger**. Here, too, the period of activation is dependent on the taring function. Another option is for the **system start-up** (power-up reset) to **trigger** a taring operation (**PN8=4**). For this, of course, there is no activation period!

8.9. Calibration mode PN9

A distinction is made between a variety of **calibration modes**. The preset input behaviour is also entered into the calibration as selected under PN0.

With **autocalibration** to the calibration point (**PN=0**), a calibration is carried out only on PN1 (end value). For this, the CAL relay is switched 2 seconds before the measurement is taken over. The calibration takes place on the basis of the calibration point. At 100%, it is taken over direct into PN1, otherwise a percentage conversion takes place.
With **semi-automatic calibration** to the calibration point, the CAL is first switched and the unit then waits at least 60 seconds for a further triggering of the calibration input. A calibration is made only to PN1!
With **automatic calibration** to PN1 and PN2 (**PN9=2**), the calibration is made first to the offset PN2. Then the CAL is switched and the unit waits 2 seconds before automatically calibrating the end value PN1.
With **semi-automatic calibration** to PN1 and PN2 (**PN9=3**), the offset PN2 is, as above, first calibrated and the CAL then switched. After this, the unit is in a wait loop for at least 60s. During this period, the trigger must be activated again so that the end value PN1 is taken over. Otherwise, the calibration is terminated without any changes being made.
With setting **PN9>3**, the relevant **calibration mode is triggered direct** after returning from the programming mode by confirming PN9.

8.10. Calibration point PN10

Calibration point **PN10** gives the **percentage target value** for the **end value calibration**. As a **rule**, **100.00 %** is preset here, in which case the measured end value is taken over direct. With **mass pressure sensors**, on the other hand, this value can be changed to **80.00 %**, so that the determined measurement must be projected to 100.00%. All other percentages can also be preset, which means that a used reference weight does not have to correspond to the set end value.

8.11. Trigger for calibration PN11

The selected **calibration mode** in PN9 can be triggered in various ways. If **PN11=0** is set, the calibration can **no longer be triggered** by simply pressing a key or applying a binary signal. In this case, a **calibration** can only be triggered via the direct start with **PN9>7** or the system interface.
Either the digital input, the 4th key or a system start-up can serve as the trigger. In particular, **PN11=4** is dealt with because no trigger is specified here with a **semi-automatic calibration**. For this reason, the calibration can be also continued via the [P] key.

8.12. Converter calibration PN12

The signal input has an **integrated self-calibration**. With this, the thermal **drift and ageing phenomena** in the signal input path can be neutralised. For areas in which **significant climate fluctuations** are to be expected, it is possible, via a cyclical calibration after **200 measurements,** to diminish the drift influence of the analogue digital converter.

8.13. Display time PN13

The **display time** can be set between **0.1 and 10.0 seconds**, whereby the last measured measurement is taken over. There is no additional averaging for the display value beyond the individual measurement. If the measuring time is longer than the display time, the display change is delayed according to the set measuring time.

8.14. Measuring time PN14

During the **measuring time**, an **averaging process** takes place. With the **set measuring time**, the **existing outputs** like analogue output, calibration points and value transmitting function are **updated**.

8.15. Display mode PN15

Via the **display mode**, the **default display** can be defined. The current measurement, the MIN value, MAX value, HOLD value or absolute value (without PN5) can be displayed.

8.16. Trigger for display change PN16

Via a **definable trigger**, **a specific display change** can be preset. Either the display can change back and forth between the absolute value (with PN5) and the current display value, or it can jump to a conversion factor or, with a MIN or MAX display, can reset the corresponding value. In the latter case, the MIN and MAX values are reset and overwritten with the current measured value until the trigger is returned again. **PN16=8** has a special status, because here no MAX/MIN values can be called up via UP or DOWN. This mode is particularly necessary with **calibrated balances** due to the possibility of occasional manipulation via the UP and DOWN keys.

8.17. Conversion value PN17

The **conversion value** can only be used on calculations in which PN2=0. With **PN17**, a **second end value** can be preset, which is offset with the current measurement. This is used, for example, for a conversion to a price. For example, 100 kg of product A costs € 230, so PN1 = 100.00 and PN17 = 230.0

8.18. Decimal point for conversion value PN18

For the **conversion value**, a **decimal point** can be defined so that the conversion value can move in a different dimension.

8.19. Analogue outputs PN20, PN21 and PN22

The parameters of the **analogue output** related to the scale of the display and are updated cyclically with the **measuring time**. Via **PN22=0**, the analogue output can be **deactivated**, whereby it stops at a starting value after a unit restart.
With **PN22>0**, the analogue output can be assigned to **various sources** (current measurement, MIN value, MAX value, HOLD value, absolute value without tare, binary converter value), whereby the preset range in PN20 and PN22 always relates to the particular scaled value.

8.20. Security setting, user level PN50 to PN53

With the parameters in the security settings, access to the program numbers is regulated through the setting of various user levels. The user levels divide the access into various levels. The user is only given access to the settings authorised by the system operator, such as the setting of thresholds. The lower the figure for the user level given under PN52, the lower the level of security of the unit parameters against user intervention. The plant operator can, if necessary, also block these settings against access by the operating staff by means of a given authorisation code for the user level in PN53. Only when the value of PN53 is parameterised in PN50 does the plant operator have access to the parameters authorised for him in the user level.

Examples:

User level (PN52 =)		0	1	2	3	4	5	6	7	8
Access to:	**PN**									
Programming lock	50	X	X	X	X	X	X	X	X	X
Serial number	200	X	X	X	X	X	X	X	X	X
Display brightness	19	X	X	X	X	X	X	X	X	
Switch threshold	61, 71, …	X	X	X	X	X	X	X		
Setpoint parameter	59...95	X	X	X	X	X	X			
Target value for taring	7	X	X	X	X	X				
Interface parameters (option)	32...34	X	X	X	X					
Analogue output parameters (option)	20...22	X	X	X	X					
Measuring input parameters	0...18	X	X	X						
Linearisation parameters for measuring input	100...130	X	X	X						
Authorisation code / User level	51, 52, 53	X								

The parameterised user level PN52 is active as long as the authorisation code PN51 and programming lock PN50 are different. On delivery both parameters are set to 0000, so that the programming lock is deactivated.

When changing to programming mode, the unit jumps to the first authorised program number. If the user level PN52 is parameterised at =3, for example, access to the program numbers of the calibration points is authorised but changing the measuring input (PN0) is not possible at this user level.

In order to obtain access to all program numbers at a later stage (corresponds to user level 0), the 4-digit locking code entered under PN51 must, in order to gain authorisation under PN50, be entered again and confirmed by activating button [P] for around 1 second. Access can then be made to all program numbers.

Caution! If the authorisation code becomes lost, the unit can be set to the default value 0000 at the manufacturer's without any data loss.

8.21. Threshold value behaviour of LED display PN59

In the event of a failure of the alarm outputs set under the setpoint parameters, a flashing of the display can be triggered in order to intensify the optical effect. The flashing of the display can be parameterised to the four different alarms. This function can also be utilised where no relays exist.

8.22. Setpoints PN60 to PN95

You can influence the behaviour of the setpoint via different program numbers. The data refer to the scaled measurement and are updated with the set measuring time. A description of the various parameters is given in section ***5.6 Relays***.
The program numbers are also available when no relays are carried out in the unit. In such cases, only the relevant alarm LED light up on the front of the display. Furthermore the flash function (PN59) of the digital display can be switched to a freely selectable combination of the alarms.

8.23. Linearisation PN100 to PN130

Through the linearisation, the user has the possibility to linearise a non-linear sensor signal. A detailed description can be found in the chapter on calibration modes.

8.24. Serial number PN200

Under the serial number, you can call up the serial number that allows allocation to the production process and the manufacturing procedure. This parameter can only be viewed.

9. Program table

The program table lists all the program numbers (PN) with their function, range of values, default values and user level.

PN	Function	Range of values	Default	User level
	Channel 1			
0	Measuring input The parameters < 5 do not necessarily need a sensor signal for calibration The parameters > 4 need sensor calibration.	0 = automatic sensor recognition 1 = semi-automatic sensor recognition 2 = 1 mV/V 3 = 2 mV/V 4 = 3.3 mV/V 5 = automatic sensor recognition 6 = semi-automatic sensor recognition 7 = 1 mV/V 8 = 2 mV/V 9 = 3.3 mV/V 10 = 6 mV/V	3	2
1	End value or full scale	-9999...99999	10000	2
2	Zero or offset	-9999...99999	0	2
3	Places after the decimal	0…4	none	2
5	Offset shift	-9999...99999	0	2
6	Tare function	0 = no taring 1 = permanent taring 2 = transient taring 3 = rapid, transient taring without message 4 = permanent taring to PN2 5 = static taring via trigger	1	2
7	Target value for taring performs direct when PN8=0	-9999…99999	0	4
8	Trigger for taring	0 = none 1 = digital input 2 = 4. key 3 = digital input or key 4 = system start 5 = combination 1 with 4 6 = combination 2 with 4 7 = combination 3 with 4	0	2

PN	Function	Range of values	Default	User level
9	Calibration mode for automatic: Calibration in % only to end value PN1 Calibration in PN to offset PN2 and end value PN1	0 = autocalibration to % 1 = semi-automatic to % 2 = autocalibration to PN 3 = semi-automatic to PN 4 = start mode 0 5 = start mode 1 6 = start mode 2 7 = start mode 3	0	2
10	Calibration point in percent **PM5** **PW5**	0.01 … 100.00 0.01 … 100.00	80.00 100.0	2
11	Trigger for calibration	0 = none 1 = digital input 2 = 4. key 3 = digital input or key 4 = system start 5 = combination 1 with 4 6 = combination 2 with 4 7 = combination 3 with 4	0	2
12	Converter calibration	0 = no converter calibration 1 = on system start 2 = every 200 measurements	1	2
	General settings			
13	Display time	0.1 ... 10.0	1.0	2
14	Measuring time	0.01...10.00	1.00	2
15	Display mode	1 = current measurement 2 = MIN value 3 = MAX value 4 = HOLD value 5 = absolute value	1	2

PN	Function	Range of values	Default	User level
16	Trigger for display change	0 = none 1 = absolute value statically to digital input 2 = absolute value statically to 4th key 3 = absolute value statically to 1 or 2 4 = none 5 = conversion value statically to digital input 6 = conversion value statically to 4th key 7 = conversion value to 5 or 6 8 = no display change at all 9 = MIN-/MAX reset statically to digital input 10 = MIN-/MAX reset statically to 4th key 11 = MIN-/MAX reset statically to 9 or 10	0	2
17	Conversion value corresponds to PN1	-9999…99999	10000	2
18	Decimal point for conversion value	0…4	0	2
19	Display brightness	0...9 (0=bright / 9=dark)	3	7
	Analogue output			
20	End value, full scale	-9999...99999	10000	4
21	Initial value, offset	-9999...99999	0	4
22	Analogue output	0 = deactivated 1 = current measurement 2 = MIN value 3 = MAX value 4 = HOLD value 5 = absolute measurement	1	4
	Interface			
34	Switch over of the interface behaviour	0 = standard operation 1 = transmission operation	0	4
35	Measurement to be transmitted	1 = current measurement 2 = MIN value 3 = MAX value 4 = HOLD value 5 = absolute value		

PN	Function	Range of values	Default	User level
	Security settings			
50	Programming lock	0000...9999	0000	8
51	Authorisation code for all parameters	0000...9999	0000	0
52	User level	0...8	8	0
53	Authorisation code for user level 0000 = User level always activated	0000…9999	0000	0
	Flashing behaviour of the LED display			
59	Display flashing (approx. 0.5 seconds) no flashing Flashing at setpoint 1 Flashing at setpoint 2 Flashing at setpoint 3 Flashing at setpoint 4 Flashing at setpoint 1 and 2 Flashing at setpoint 3 and 4 Flashing at setpoint 1, 2, 3 and 4	 0 no flashing 1 flashes with 1 2 flashes with 2 3 flashes with 3 4 flashes with 4 5 flashes with 1 or 2 6 flashes with 3 or 4 7 flashes with 1, 2, 3 or 4	0	5
	Setpoint 1			
60	Setpoint 1	0 = deactivated 1 = current measurement 2 = MIN value 3 = MAX value 4 = HOLD value 5 = absolute value 6 = sensor fault	1	5
61	Threshold	-9999...99999	1000	6
62	Hysteresis	1...99999	1	5
63	Active above / below SP value	0 = active below SP 1 = active above SP	1	5
64	Switch delay	0.0...10.0 seconds	0.0	5
65	Delay type	0 none 1 switch-on delay 2 switch-off delay 3 switch-on/-off delay	1	5
	Setpoint 2			
70	Setpoint 2	0 = deactivated 1 = current measurement 2 = MIN value 3 = MAX value 4 = HOLD value 5 = absolute value 6 = sensor fault	1	5
71	Threshold	-9999...99999	1000	6
72	Hysteresis	1...99999	1	5
73	Active above / below SP value	0 = active below SP 1 = active above SP	1	5
74	Switch delay	0.0...10.0 seconds	0.0	5

PN	Function	Range of values	Default	User level
75	Delay type	0 none 1 switch-on delay 2 switch-off delay 3 switch-on/off delay	1	5
	Setpoint 3			
80	Setpoint 3	0 = deactivated 1 = current measurement 2 = MIN value 3 = MAX value 4 = HOLD value 5 = absolute value 6 = sensor fault	1	5
81	Threshold	-9999...99999	1000	6
82	Hysteresis	1...99999	1	5
83	Active above / below SP value	0 = active below SP 1 = active above SP	1	5
84	Switch delay	0,0...10,0 seconds	0,0	5
85	Delay type	0 none 1 switch-on delay 2 switch-off delay 3 switch-on/off delay	1	5
	Setpoint 4			
90	Setpoint 4	0 = deactivated 1 = current measurement 2 = MIN value 3 = MAX value 4 = HOLD value 5 = absolute value 6 = sensor fault	1	5
91	Threshold	-9999...99999	1000	6
92	Hysteresis	1...99999	1	5
93	Active above/ below SP value	0 = active below SP 1 = active above SP	1	5
94	Switch delay	none	0,0	5
95	Delay type	0 keine 1 switch-on delay 2 switch-off delay 3 switch-on/off delay	1	5
	Linearisation			
100	Number of additional calibration points	0...30	0	2
101 ... 130	Calibration points 1...30	-9999...99999		2
	System information (unadjustable)			
200	Serial number	0...99999	0	8
204	Event/configuration counter	0…9999	xxxx	8

PN	Function	Range of values	Default	User level
205	Software version		xxxx	8

10. Technical data

Housing		
Dimension	96 x 48 x 134 mm (WxHxD) including screw terminal 96 x 48 x 148 mm (WxHxD) including plug-in terminal	
Assembly cut-out	$92.0^{+0.8}$ x $45.0^{+0.6}$ mm	
Wall thickness	0...50 mm	
Fixing	Snap-in screw element	
Material	PC/ABS-plastics blend, black, UL94V-0	
Protective system	standard IP54 (front), IP00 (back)	
Weight	approx. 450 g	
Connection	Screw- /plug-in terminal; line cross section up to 2.5 mm^2	
Mounting grid	horizontal 120 mm / vertical 96 mm (recommended)	
Display		
Digit height	14 mm	
Segment colour	red	
Display range	-9999...99999	
Setpoints	one LED per setpoint	
Overflow	horizontal bars at top	
Underflow	horizontal bars at the bottom	
Display time	0.1...10.0 seconds	
Input (DMS)		
Measuring range adjustable	± 6 mV/V ± 3.3 mV/V ± 2 mV/V ± 1 mV/V	
Measuring accuracy	0.002 % of measuring range	under laboratory conditions
up to 1 s measuring time	0.1 % of measuring range	in controlled electro-magnetic environment
	0.75 % of measuring range	in industrial areas
Measuring bridge	200 Ω … 500 Ω	standard 350 Ω
Bridge supply	approx. 10 VDC	
Input resistance signal		
PW5	> 10 MΩ	
PM5	approx. 5 kΩ	
Temperature drift	20 ppm/K	
Measuring principle	Sigma/Delta	

Measuring speed	0.01 …10.00 seconds
Resolution	24 bit max.19 Bit RMS

Output

Relay	switchover contact 230 VAC / 5 A; 30 VDC / 2 A with ohm resistive burden
Switching cycles	0.5 * 10^5 at max contact rating 5 * 10^6 mechanically Separation as per DIN EN 50178 Characteristics as per DIN EN 60255
Analogue output (galvanic insulated)	0...10 V (12 bit) load ≥ 1 kΩ 0...20 mA (12 bit) load ≤ 500 Ω 4...20 mA (12 bit) load ≤ 500 Ω
Error	0.1 % in the range T_U= 20...40°C, beyond 50 ppm/K
Internal resistance	100 Ω

Setpoint

Protocol	Manufacturer-specific ASCII
RS232 (optional galv. insulated)	9600 Baud, no parity, 8 databits, 1 stopbit
Lead length	max. 3 m
RS485 (optional galv. insulated)	9600 Baud, keine Parität, 8 Datenbit, 1 Stopbit
Lead length	max. 1000 m

Power supply

Supply voltage (galvanic insulated)	230 VAC / 50/60 Hz / ±10 % 115 VAC / 50/60 Hz / ±10 % 24 VDC / ±10 %
Power consumption	**max. 15 VA**

Memory	Parameter memory EEPROM
Data life	>100 years

Ambient condition

Working temperature	0...60 °C
Storage temperature	-20...80 °C
Climatic resistance	rel. humidity ≤ 75 % on year average without dew

EMV	DIN 61326
CE-Sign	conformity to 89/336/EWG
Safety standard	DIN 61010

11. Error elimination

The following list gives the recommended procedure for dealing with faults and locating their possible cause.

11.1. Questions and answers:

- The unit permanently indicates overflow. „‾ ‾ ‾ ‾ ‾“
  - The input has a very high measurement, check the measuring circuit.
  - There is a line break or the unit is wrongly connected.
  - The measuring input is not correctly scaled, which means that the display should show a higher value than 99999.
- The unit permanently shows underflow. „ _ _ _ _ _ “
  - The input has a very low measurement, check the measuring circuit.
  - The measuring input is not correctly scaled, which means that the display should show a lower value than 99999.

I. The word “**HELP**” lights up in the 7-segment display.

- The unit has found an error in the configuration memory. Perform a reset on the default values and reconfigure the unit according to your application.

II. Program numbers for parameterising the input are not accessible.

- The programming lock is set at a user level that does not allow access.
- Under PN1, a different sensor type was parameterised so that the desired program number cannot be parameterised.

III. "Err1" lights up in the 7-segment display.

- This error can only be eliminated by the manufacturer.

11.2. Reset to default values

To return the unit to a defined basic state, a reset can be carried out to the default values.

The following procedure should be used:

- ✔ Switch off the power supply.
- ✔ Press button [P]
- ✔ Switch on the power supply and press [P] for further approx. 2 seconds.

With reset, the default values of the program table are loaded and used for subsequent operation. This puts the unit back to the state in which it was supplied.

Caution! This is only possible when the programming lock PN50 allows access to all PNs or “**HELP**” is shown in the display.

Caution! All application-related data are lost.